

TIRE EQUIPMENT
for
Goodyear
PRODUCTS

MANUFACTURED BY
Firestone
TIRE & RUBBER CO.

AKRON, OHIO.

HAMILTON, ONT.



*The Mark
of Quality*

"America Should Produce Its Own Rubber"

Foreword

THE importance of the tire requirements for Ford products has for years been recognized and acted upon by the Firestone organization. Realization of the vast scope of this field and the varied conditions of operation that exist within it, long since led Firestone men to intensive study and development of tires to meet the specific needs of this great army of tire buyers.

This booklet presents some of the methods followed and results obtained. It indicates the Firestone purpose and determination to give Ford users, at all times and under all conditions, tire service based on the highest principles of good business and expressed in the Firestone pledge of Most Miles per Dollar.



TAPPING A RUBBER TREE

Tapping is the process employed to extract the fluid or latex from rubber producing trees. A specially gauged knife is used and the tappers are trained to cut the bark to the correct depth and thickness.

The Origin and Early History of Rubber

THE discovery of rubber by the early Spanish and Portuguese explorers dates back four hundred years. From South America the Portuguese took samples of rubber articles to Europe in 1536, and shortly after, the colonization of Brazil led gradually to a considerable trade in rubber goods which stimulated experiments with the new substance by chemists and scientists.

It was not until the nineteenth century, however, that the series of discoveries were made which brought into existence the rubber goods industry.



FIRESTONE GODOWN AT SINGAPORE

The exterior of the Firestone Godown (warehouse) at Singapore. Especially designed and built for the handling of crude rubber. Equipped with modern American machinery for preparation and packing of rubber in the most economical manner. From various sections of Great Britain's Far Eastern possessions and the Dutch East Indies, rubber is gathered into this warehouse.

The discovery of the process known as vulcanization prepared the way for the greatest single use to which rubber is put—the automobile tire.

The Principal Sources of Rubber Supply

SHORTLY after the early rubber manufacturers got well under way, they began to experience difficulties in obtaining sufficient supplies of raw product. The Amazon valley region was the first and long remained the best and chief source of supply. It was not until 1900 that the Far East became a source of supply, the British having imported rubber seeds from Brazil and transplanted them in Ceylon and the Malay Peninsula. In twenty years the British Colonies in the Far East had become the principal source of supply.



FACTORY WASHING OPERATIONS

To insure rubber being absolutely free from impurities, Firestone maintains washing equipment at the factory. The machinery used consists of two revolving rolls between which the rubber is masticated to expose its surface to the action of a continuous stream of water.

The British Crude Rubber Restriction Act

ABOUT a year ago the British planters, realizing their dominance over the supply, sought to obtain higher prices by inaugurating legislation that restricted the production and exportation of rubber. This act advanced rubber from 15 cents per pound to 37 cents in approximately three months.

Realizing the menace to the progress of highway transportation, Mr. Harvey S. Firestone led a vigorous campaign against the legislation, obtaining government assistance in investigating new sources of supply and arousing such a wave of protest that the market reacted and rubber receded to 26 cents a pound. It has been estimated that Mr. Firestone saved American consumers approximately \$70,000,000 by his activities.

Mr. Firestone has organized a movement for America to produce its own rubber and has sent investigators to the Far East, Africa, Central and South America to survey all potential sources.

The Development of Rubber Tires

OF the world's rubber production of today, about two-thirds is absorbed in motor tire manufacture.

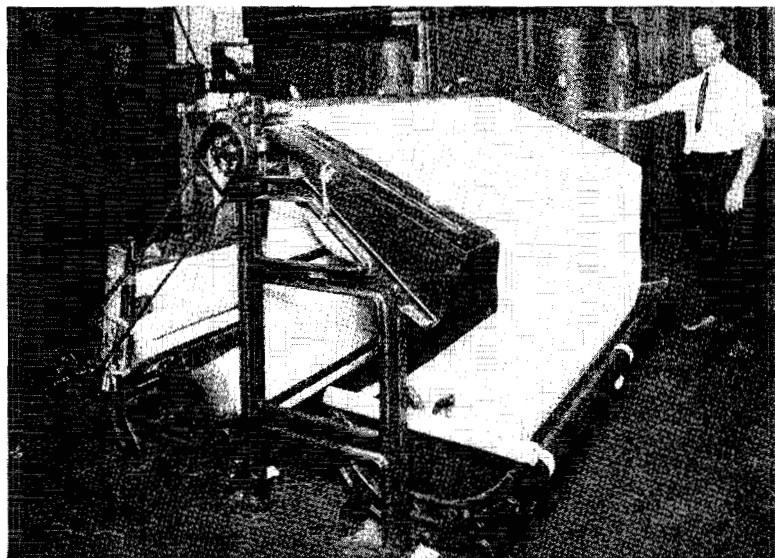


MILLING

The mixing of compounding ingredients is carried out on a mill. The operator first puts the rubber on the mill and works it until it is plastic and adhesive. When "broken down," the other ingredients are added and the whole worked until a uniform and thoroughly mixed mass is obtained.

Although the first patent for a pneumatic tire was taken out by W. H. Thomson, an Englishman, in 1845, it was not until many years later, in 1880, that rubber tires began to come into wide use. Solid rubber tires were adopted about that time for cabs, carriages and bicycles, and the improvement of pneumatic tires in 1890, made bicycling popular in Europe and America.

From 1880 on there were many experiments with solid tires, based first on the clincher principle, and then on various ideas of retaining wires. Prominent among these was the side wire tire brought out by the Firestone Tire & Rubber Co. It made possible the use of solid tires in widths up to seven inches, providing tire equip-



PHYSICAL INSPECTION OF FABRICS

Firestone not only tests fabric on special instrument in the laboratories, but inspects the many thousand yards required in daily production. The fabric is unrolled and passed over a large plate glass frame, illuminated from beneath by powerful lights which show up the slightest imperfections or irregularities. A defective area is cut out and discarded.

ment for the larger and heavier vehicles in demand for commercial purposes.

Since 1910 the retaining wire principle has been supplanted by the use of hard rubber, vulcanized to a corrugated steel base, as a means of holding fast the resilient rubber tread to the rim. These are of two types—removable and pressed-on.

Pneumatic tires since Thomson's patent was granted have undergone tremendous development. In 1880, John B. Dunlop of Belfast, Ireland, patented a double tube bicycle tire. His invention was followed by others in England and America, and in 1889, a patent issued



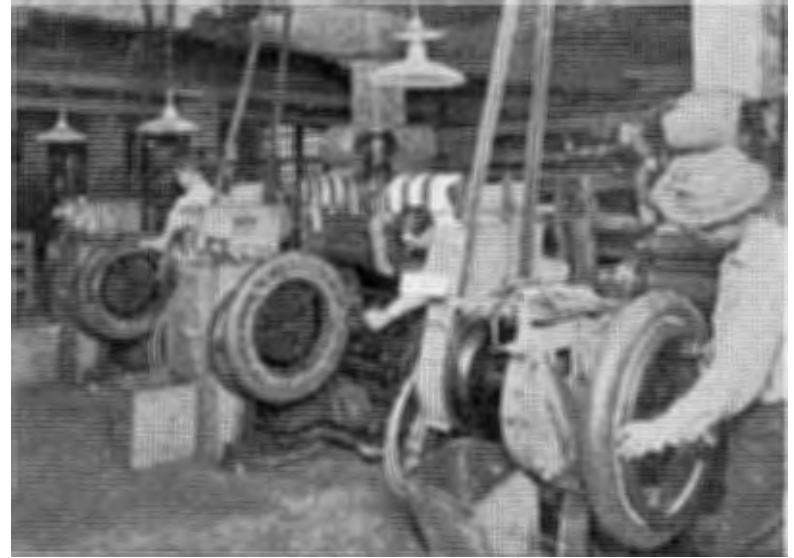
CALENDERING THE FABRIC

This operation involves impregnating and coating fabric with rubber. While hot and plastic the rubber is drawn between rollers with the fabric resulting in thorough impregnation of the fabric. The control mechanism for moving the rolls on the calender shown is so perfect that a gauge accuracy of less than .002 of an inch can be maintained.

to Thomas covered the making of the tread thicker and tougher than the other parts of the tire.

The single tube tire was abandoned soon after the automobile began to come into quite general use. The clincher, soft bead, double tube tire rapidly took its place.

Between 1900 and 1905, the clincher tire was perfected in America. About 1905, the detachable rim was invented, overcoming the difficulty of stretching the larger sized tires over the clincher rim, and permitting the use of the inextensible wire bead. In 1915, American manufacturers settled down to the production of



BUILDING THE CARCASS

The illustration shows how the builders stretch and properly balance, under tension, each layer or ply of fabric on the core. These must be carefully pulled down so as to fit perfectly and tightly without creases or air bubbles. The bead is applied on each side and pressed in, as shown by the operator at the right.

two principal types of pneumatic tires—the soft bead clincher in smaller sizes and the wire bead straight side for larger sizes.

Firestone Organization at the Sources of Raw Material Supply

SINGAPORE, capital of the British Straits Settlement, is the natural center of the rubber plantation industry. Here Firestone maintains buying headquarters, where expert purchasers obtain the finest crude rubber for export to Akron.

At Singapore, too, Firestone owns and operates a modern godown, or warehouse, equipped with machin-



VULCANIZING PNEUMATIC TIRES

Cord tires, in general, are cured on expanded air bags, while fabric tires are cured on rigid metal cores. The picture shows the molds containing the uncured or green finished tires being lowered into the heater. After all the molds are in, the heater is sealed, live steam is turned on and definite pressures maintained until the tires are cured—the period varying from one to three hours.

ery for the preparation and packing of crude rubber in the most economical manner.

By buying directly at the source, Firestone is able, not only to secure the best quality, but to take the utmost advantage of the market. At the Firestone buying headquarters, elimination of all waste, together with scientific packing for shipment, effects other economies that enter materially into the ultimate tire value the car owner gets for his money.

In the same way Firestone goes directly to the sources to obtain raw material for cotton fabric. Intelligent buying, at the most opportune times, through complete and first hand acquaintance with cotton market conditions, wide resources and influence, achieve big sav-



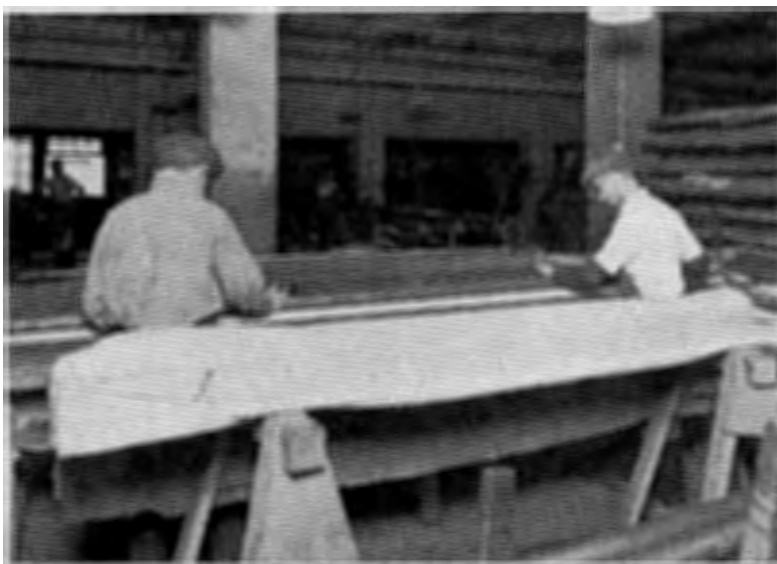
FINAL INSPECTION AT PLANT No. 2

After final trimming, washing, drying and receiving an inner protective coating of special white paint, the tire passes down a narrow gangway conveyor before a series of inspectors, who go over it for the slightest imperfections or blemishes.

ings that are passed along in finer tire quality offered at lower prices. Rigid inspections, and exacting tests for uniformity and tensile strength of the completed cord fabric are further factors in maintaining the Firestone standard of Most Miles per Dollar.

Firestone's Development of Manufacturing Facilities

WITH its two great tire manufacturing units, Plant No. 1 and Plant No. 2, and with its new large steel rim plant, Firestone is equipped for volume production on a tremendous scale. The capacity of the two tire building plants is 36,000 tires daily.



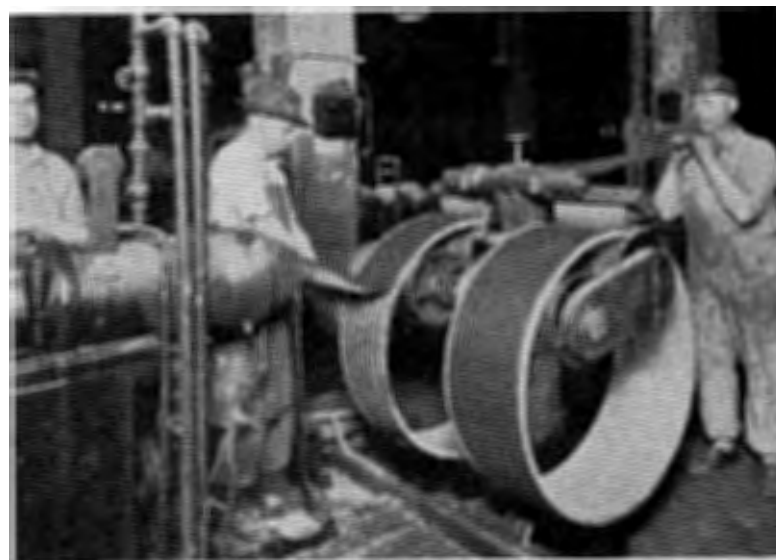
BUILDING INNER TUBES

After warming up, the special tube stock is put on the calender and first rolled into thin sheets. The tube stock is then built up to certain thickness by laminations. Strips, properly cut, of this tube stock, are placed upon air-cushion tables and rolled or wrapped twice around long iron mandrels before being vulcanized.

Within these two modern factories, specialization has been developed to a high point of perfection. Scientific organization has provided for the most economical flow of materials, the least loss of time or motion, and the most efficient handling, by skilled workers, expertly supervised, of each of the many processes and operations that go into the completed tire. Firestone resources have permitted the acquisition of the finest and most up-to-date equipment, and Firestone opportunities have attracted the best tire building talent.

Plant No. 2 and Its Service to Ford Owners

EARLY recognition of the tremendous importance of the 30x3½ inch tire, led Firestone to build a special factory—Plant No. 2, devoted to the exclusive

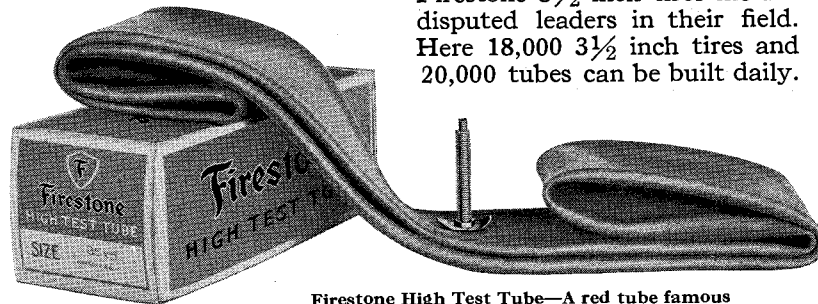


**BUILDING FIRESTONE SOLID TRUCK TIRES
APPLYING HARD RUBBER BASE**

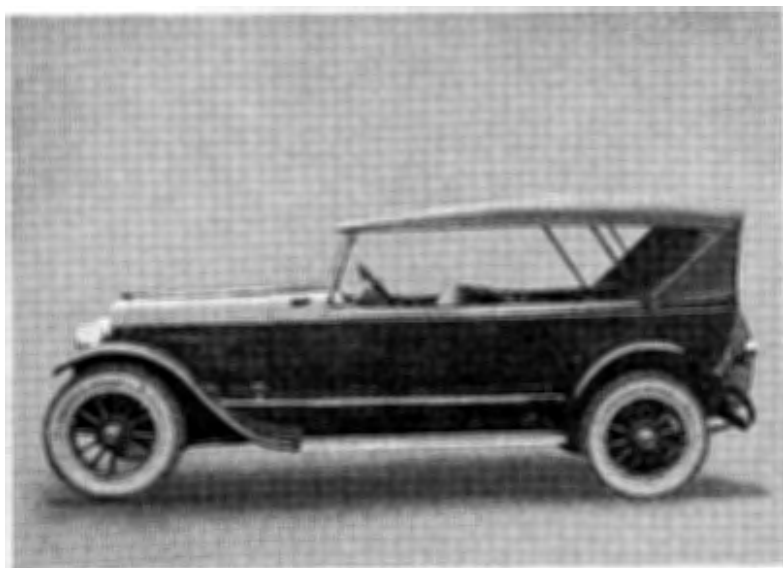
Solid tires are built up on steel rims which remain a permanent part of the finished tire. The first covering operation to the rim is brass, then follows a coating of cement. The rim is then placed in front of a tubing machine which gradually extends a thin band of gum compound over the revolving rim. This compound affords a hard rubber base for the tire.

production of tires and tubes for light cars. In this a separate and distinct factory organization was developed to give Ford owners the best possible tire value. The special equipment, arrangement and systematization, and the intensive application to technical and structural problems of tires for light cars have made

Firestone 3½ inch tires the undisputed leaders in their field. Here 18,000 3½ inch tires and 20,000 tubes can be built daily.



Firestone High Test Tube—A red tube famous for consistent high mileage.



LINCOLN TOURING CAR

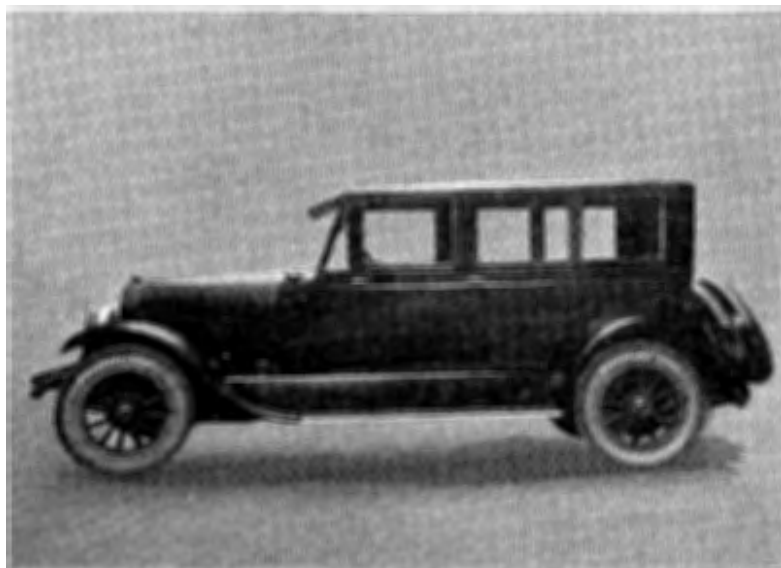


Tire Building Involves Many Operations

THE processes involved in tire building may be roughly divided into two groups—the preparation of the raw materials, and the fabrication of the prepared raw materials.

In the first classification there is the inspection and drying of fabric, splitting the bales of crude rubber,

The pledge of Most Miles per Dollar is a constant challenge to the men who build Firestone Cords. Public confidence in Firestone ability to maintain that pledge keeps Firestone workers conscious of their responsibility as builders of the finest cord tires. To this must be credited the success of Firestone Gum-Dipped Cords this year, and the certainty that their quality can never grow less.



LINCOLN SEDAN

sorting, washing, drying, massing, compounding, milling and aging. Each of these steps requires specialized understanding.

The mixing, or compounding, of ingredients with rubber, for instance, calls for exact knowledge of when they must be added, and skill in working the mass uniformly and thoroughly. The visitor to the Firestone plants is impressed with the care and accuracy with which every minute detail of these processes is performed.

The second group mentioned above, includes, in the building of pneumatic tires, calendering, bias-cutting, making beads, tubing tread, assembling materials, building the carcass (involving several difficult and complicated operations), finishing (under which comes the putting on of the chafer strip, the sidewall, the

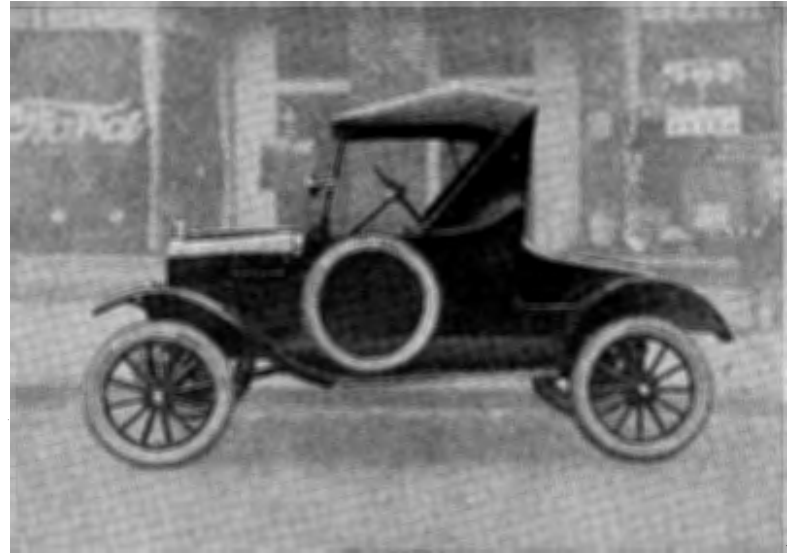


FORD TOURING CAR

cushion, the breaker strip, and the tread), vulcanizing, stripping, inspection and wrapping.

The accompanying illustrations indicate how complex many of these operations are. Every process is carried on by specially trained workers—masters of their part of the work. Scrupulous inspections, at all points, insure uniformity of quality in every one of

Of the great army of Ford owners all over the world, a big percentage have found ultimate tire satisfaction in the Firestone Extra Size Non-Skid Fabric Tire. The stout carcass of long-staple cotton fabric and choice rubber, together with the rugged non-skid tread of tough, resistant compound, produces long mileage and all-around service at so low a cost that thousands of these tires must be built daily to satisfy the demand.



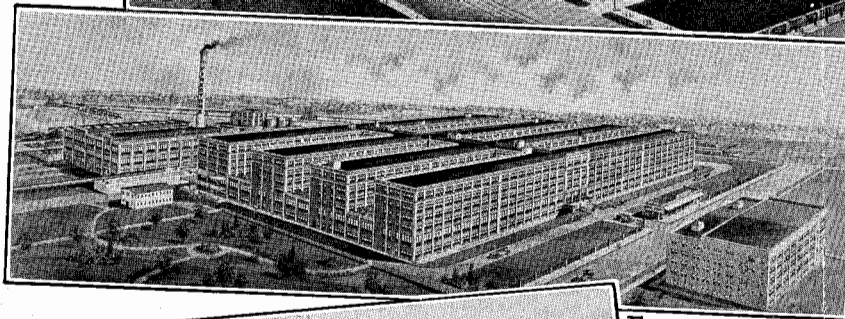
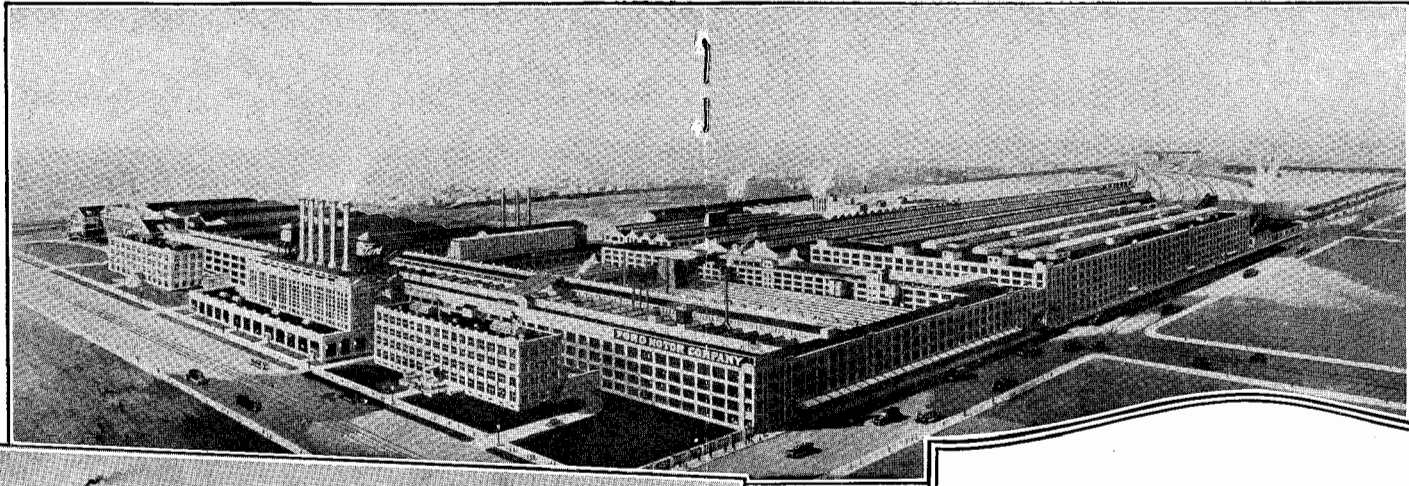
FORD ROADSTER

the thousands of tires shipped daily from the plant.

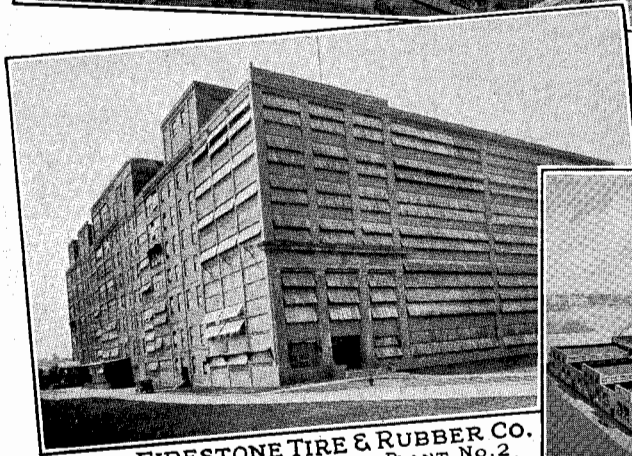
Three 3 1-2 Inch Tires

TO accommodate the preferences of every light car owner Firestone builds three types of 3½ inch tires. These are the Firestone Extra Size Cord, the Firestone

The Firestone Extra Size Non-Skid Fabric Tire is recognized by Ford Owners everywhere as the greatest value obtainable. Built in a plant devoted exclusively to the manufacture of this one tire, it combines a uniform standard of highest quality with a price that is possible only under such economical manufacturing conditions as exist in Firestone Plant No. 2. More than 10,000,000 of these highest quality tires have been produced in this specialized plant during the past five years—over 3,000,000 during the last twelve months—in order to meet the ever-growing demand of Ford owners.

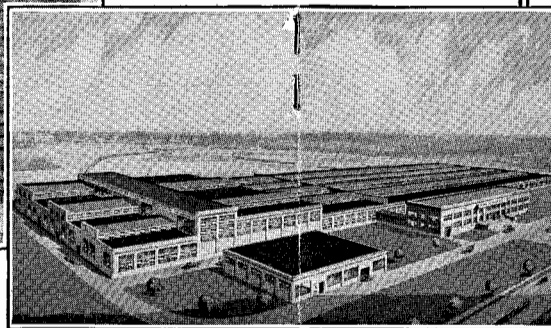


FORD
MOTOR CO.
HIGHLAND PARK
PLANT



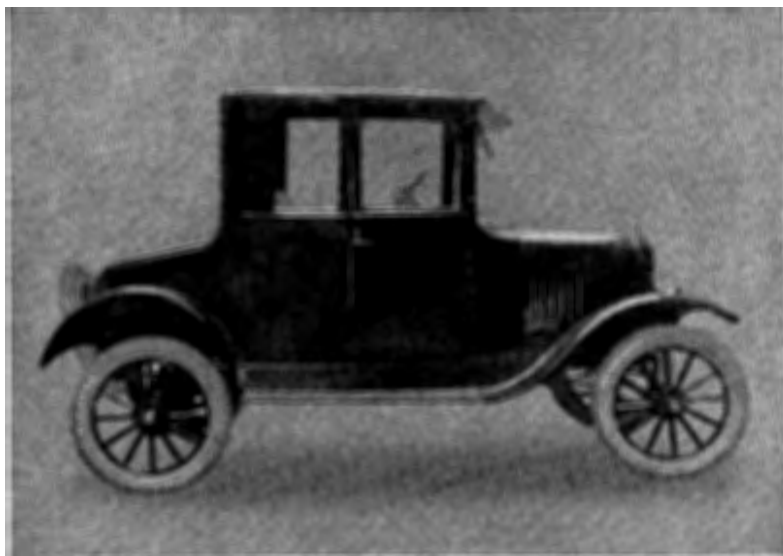
FIRESTONE TIRE
& RUBBER CO.
PLANT No. 1

FIRESTONE TIRE & RUBBER CO.
PLANT No. 2



FIRESTONE
STEEL PRODUCTS CO.

FIRESTONE has applied the idea of volume production on an economical basis, to give the tire-buyer Most Miles per Dollar. In Firestone manufacture, specialization and organization have been thoroughly carried out. The careful planning of operations, the complete co-ordination of activities and the steady forward flow of materials, result in a reduction of waste and a consequent greater value in the product.



FORD COUPE

Regular Size Cord and the Firestone Extra Size Non-Skid Fabric. Each, in its price classification, is built to give the user the most miles for his money. All have established themselves in popularity as thoroughly

The Firestone Regular Size Cord—a standard full-size tire of Firestone first quality construction was brought out last year to provide a reliable cord tire for light car owners at a price but little higher than is paid for many fabric tires. It has won a big following through sheer merit of performance and economical mileage cost.

Two favorites with Closed Car owners, Firestone Regular Size Cord and Firestone Fabric.

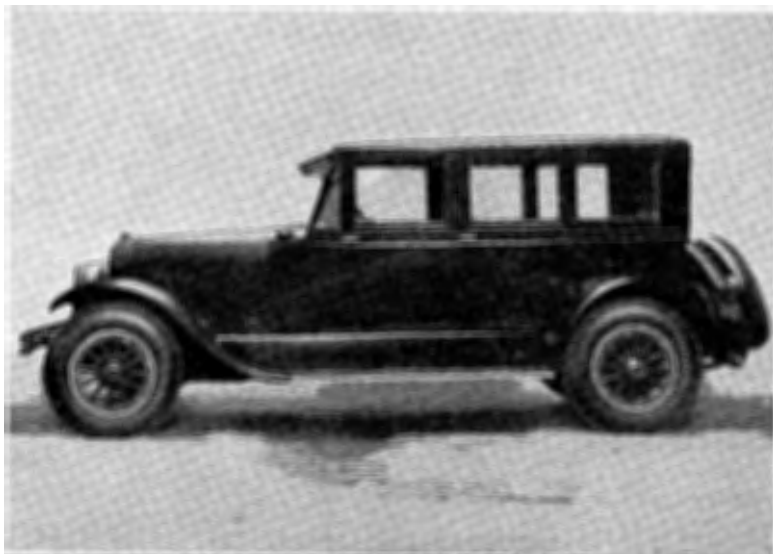


FORD SEDAN

dependable values; all have given demonstrations of mileage that command respect for the things Firestone has done to raise the standard of service in tires for Ford users.

The Firestone Extra-Size Non-Skid Cord has the features that have established all Firestone Cords as the tires of outstanding value—the famous thick, tough tread in the cross and square pattern, gum-dipped carcass construction, and extra air capacity giving increased resilience and Most Miles per Dollar.

Firestone Extra Size Cord and Firestone Fabric—Both popular among owners of Ford cars of all types.



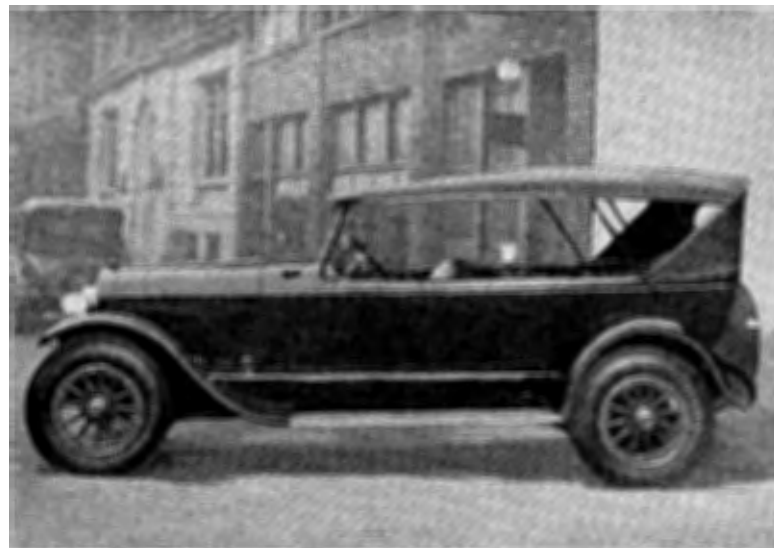
LINCOLN SEDAN EQUIPPED WITH BALLOON GUM-DIPPED CORDS



Firestone Balloon Gum-Dipped Cords

GREATER comfort, safety and car conservation without sacrifice of service or economy is Firestone's latest contribution to motoring progress by the introduction of the Balloon Gum-Dipped Cord.

It has twice the air volume capacity of the regular tire but requires only half as much air pressure. New and original ideas are embodied in its design and construction. Thin sidewalls make it extremely flexible while



LINCOLN TOURING CAR ON BALLOON GUM-DIPPED CORDS

the tread is much wider and gives greater traction and control under the most difficult traffic conditions. It grips the road firmly and holds on wet pavements, ice and snow.

The tread too, is of special design and of great flexibility, so that it permits the tire to absorb road irregularities. You derive a sensation never before experienced in ease of control and riding comfort, while the life of the car is lengthened because of the protection from jars and jolts to the body and chassis.

Balloon Gum-Dipped Cords for Lincoln Cars

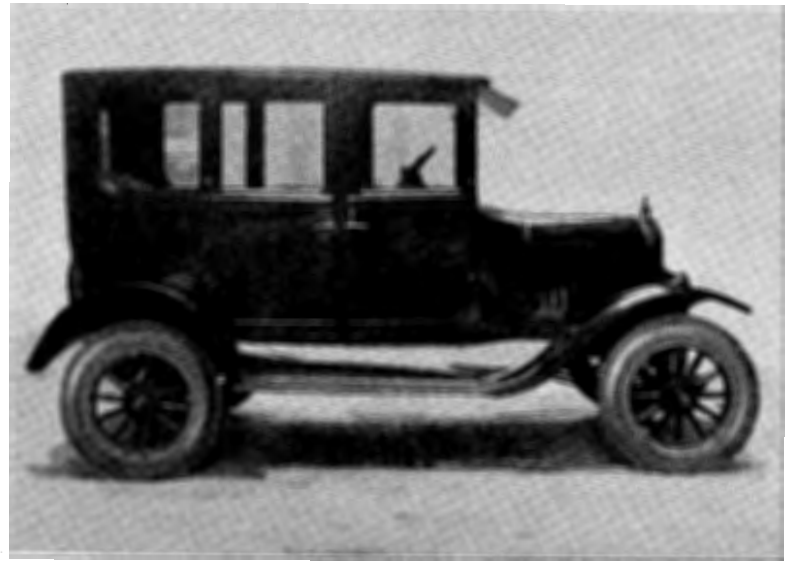
All Lincoln models require the 7.30 tires and 30x5 passenger car rims. Your Ford dealer has full information to enable him to take care of the change-over from your present equipment to the wheel equipment for Balloon Cords. He can also secure for you the wheel equipment in any type desired, wire, wood or disc.



FORD COUPE ON BALLOON GUM-DIPPED CORDS

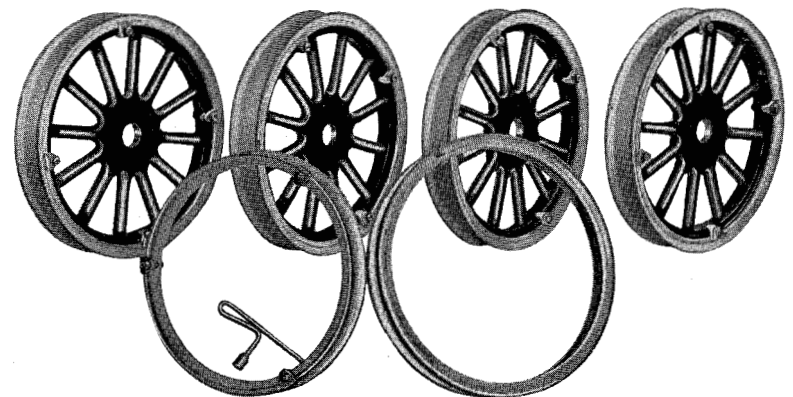
Balloon Gum-Dipped Cords for Ford Cars

ALL models use 4.40 tires with 28x3 $\frac{1}{2}$ inch rims. Firestone has built and now have available through dealers, complete sets of Ford wheels that may be applied readily to Ford hubs. These wheels are neatly finished in black. No clearance difficulties are encountered in the change from regular wheel equipment to the new size to accommodate the Balloon Cords. Wire and Disc wheels are also furnished by certain manufacturers whose names your dealer can furnish.



FORD SEDAN ON BALLOON GUM-DIPPED CORDS

Complete set of Firestone rims with spare and spare carrier as illustrated can be obtained for the proper use of Balloon Cords.



FIRESTONE FORD WHEELS AND RIMS FOR BALLOON GUM-DIPPED CORDS



FORD TRUCK WITH DUMP BODY

Firestone Truck Tire Equipment

FIRESTONE'S immediate, practical grasp of haulage needs won for Firestone a pre-eminence in the minds of truck owners and operators. The performance of Firestone Truck Tires — pneumatic, solid and cushion — has shown conclusively that not only does Firestone know the truck user's needs in

Firestone Solid Truck Tires are known everywhere for big mileage under the hardest service. The special compound Firestone uses gives toughness and extreme resistance to the grinding wear of heavy loads and rough going, with remarkable resiliency.



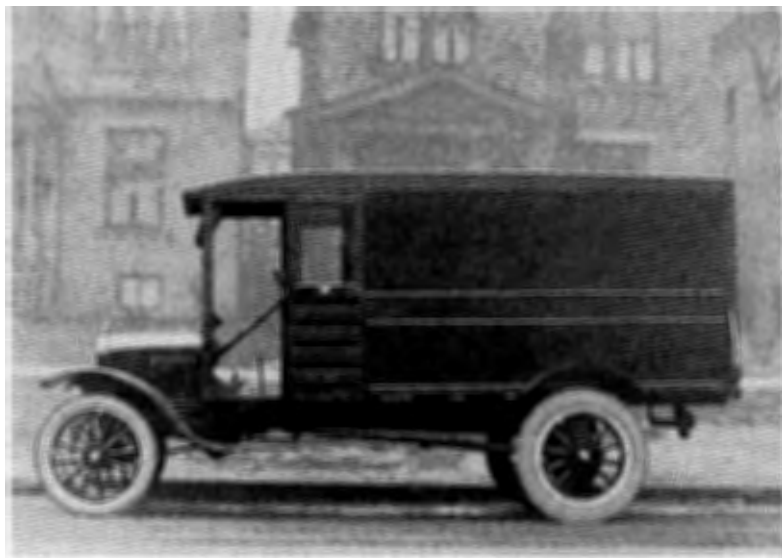
FORD TRUCK WITH STAKE BODY

tires, but is able to build the tires that best fill those needs.

The Firestone Rim Plant and Its Service to Ford Owners

FIRESTONE has made an important contribution toward bettering tire service through its improvement in rim design, and the production of rims in its own special plant.

The widely-endorsed Firestone Truck Type Cord comes in sizes for Ford Trucks. Its stout, highly resilient carcass, its broad, massive tread in the non-skid pattern, its built-up shoulders providing added carrying capacity are important features in the dependable operation of trucks and in keeping mileage costs down to rock-bottom.



FORD TRUCK WITH PANEL BODY

Rims are a real factor in tire mileage, and Firestone Rims are not only a big convenience to Ford owners through their easy application, and removal, but a material aid to economical tire service.

In Firestone Rims for Fords, a combination nut and clamp is used — which gives only one piece to handle. The valve stem passes through a sleeve riveted in the valve stem hole which construction absolutely prevents the valve stem from chafing the inner tube.

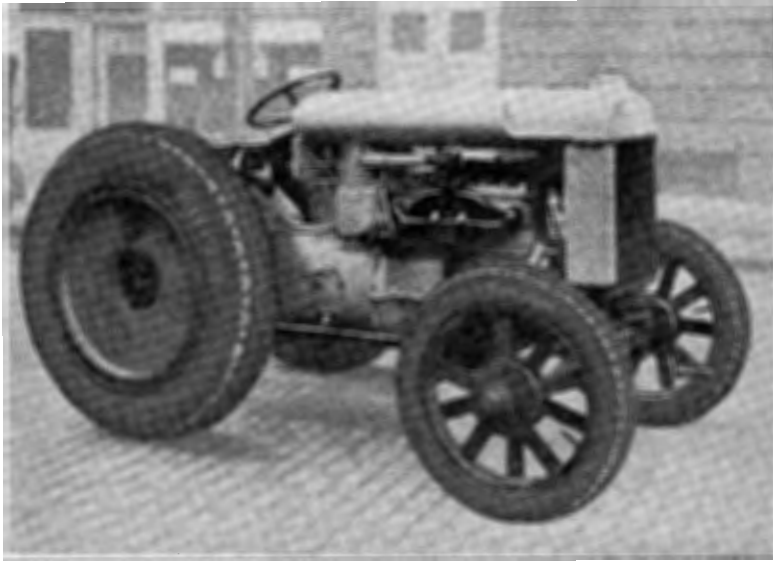
For years the Firestone has been the recognized quality rim — used as a standard equipment on most of the better known cars. The special design for Ford cars was developed after thorough study of their specific needs under all operating conditions.



FORDSON TRACTOR

Firestone Tires For Fordson Tractors

FIRESTONE has also pioneered in the development of tractor tires, and many of these successful types are illustrated in this booklet. The qualities of endurance and wear resistance, of effective cushioning and traction, are the outgrowth of many years of successful truck tire building. Upon this experience, Firestone engineers have developed tractor tires adapted to the arduous conditions under which they must perform. Firestone tractor tires have already won a place for themselves comparable to that held by Firestone truck and passenger car tires.

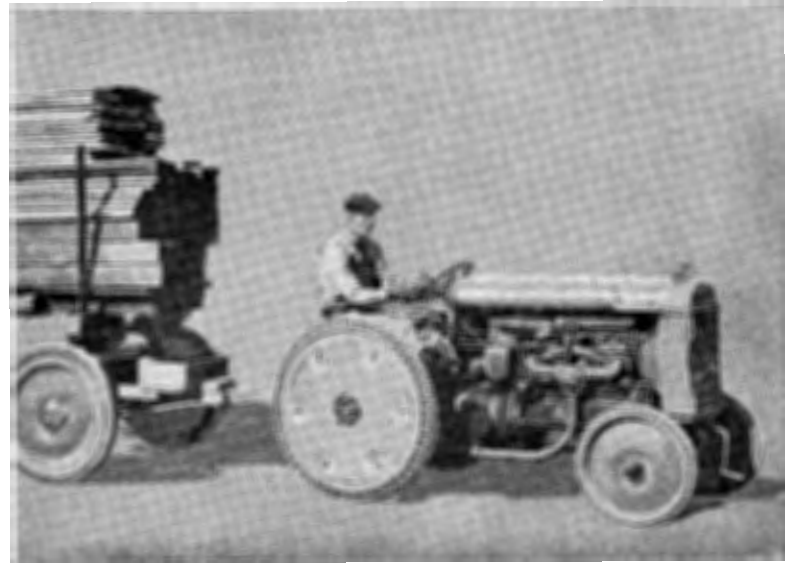


FORDSON TRACTOR—EQUIPPED WITH FIRESTONE TRACTOR CORD TIRES

Firestone Service National in Scope

OF major importance to all who drive cars and operate trucks is Firestone's nationally-organized distribution and scope. There are 107 points of distribution in the principal cities of this country, and over 20,000 tire dealers, making it possible to secure Firestone Tires and Firestone Service in practically every locality.

The Firestone Truck Type Cord in 40x8 size has come into favor as tractor equipment. Great carcass strength, broad road-contact and effective traction of the thick, rugged tread, are advantages needed in this field of service. Big mileage capacity make these tires economical.



FORDSON TRACTOR WITH WHITEHEAD & KALES WHEELS AND
FIRESTONE MAXI-CUSHION TIRES

The Firestone dealers' sound business policies have helped build Firestone reputation for good value and fair dealing.

The Firestone Maxi-Cushion is an all-rubber cushion that gives unusual resilience with the long mileage of solids. The deep pockets on the side giving effective deflection under shocks and jars, the high-profile of the tire, and the remarkable compound account for its unusual cushioning qualities.

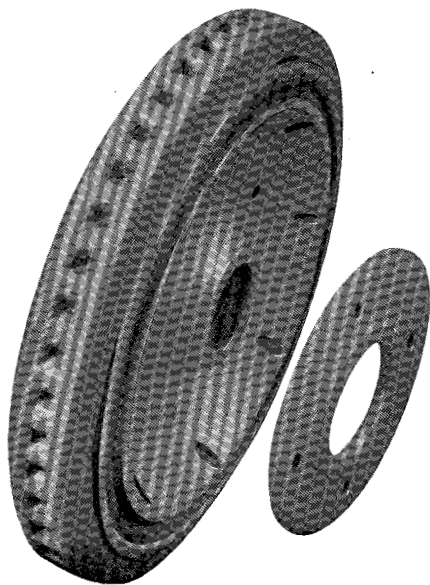
The extraordinary road grip of the Firestone Cup Cushion tire has never demonstrated its value more conclusively than in tractor service. Mounted on Whitehead and Kales wheels the Cup Cushion has already won for itself a high place in industrial tractor haulage.





FORDSON TRACTOR WITH WHITEHEAD & KALES WHEELS AND
FIRESTONE CUP CUSHION TIRES

Firestone Cushion Tractor Wheel



FIRESTONE has developed a steel cushion tractor wheel and a special tractor tire which meets the need of adequate cushioning of the tractor on uneven streets and roadways. This wheel, built with a rubber cushion between the wheel felloe and the base provides a permanent shock absorbing protection to the tractor. The road



FORDSON TRACTOR AND GRADER EQUIPPED WITH FIRESTONE
HEAVY DUTY CUSHION TIRES

gripping tire permits the tractor's normal draw bar pull.

Demountable auxiliary weights are furnished which may be fastened at the hub centers of the rear wheels. These enable the tractor to deliver its maximum draw

Firestone Heavy Duty Cushion Tires are used in smaller sizes on Ford Trucks and in larger sizes on Fordson Tractors. The deep traction groove at the center with alternating cross-members gives extra resilience, more effective traction and increased "cooling area."



bar pull. The weights being demountable, allow easy adjustment of tractor weight for all conditions.

While five inch tires are standard equipment six and seven inch tires can be applied to the same wheels, which together with the demountable hub weights makes a combination for traction pull and cushion to suit every purpose and condition of service.

The Firestone cushion wheels provide a cradle for carrying the entire weight of the tractor and road shocks are absorbed and dissipated in the wheel cushion. The cushion is indestructible as it is housed between two rings of steel.

Firestone Fan Belts

FIRESTONE has developed a new fan belt for Ford cars. It is made with four plies of fabric, thoroughly impregnated with high grade oil resisting rubber

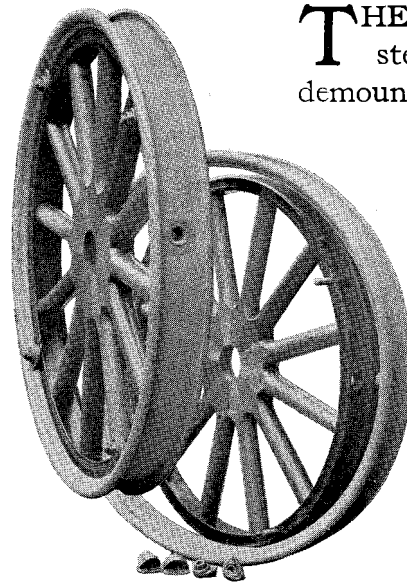


friction. Each ply has an extra skim coat of rubber compound which insures perfect adhesion, flexibility and long life.

Firestone Truck Tire Service Dealers

FOR truck owners and operators there are over 800 Firestone Truck Tire Service Stations, where all types of Firestone Truck Tires may be obtained. These truck tire dealers are thoroughly informed on haulage conditions in your particular vicinity. They know the type of Firestone Truck Tire that best meets your needs. Their Stations are equipped with hydraulic presses for quick application of tires.

Steel Felloe Wheel and Demountable Rim



THE new standardized Ford steel felloe wheel, carrying demountable rims is both true and strong, because it is sized as it is assembled. The Firestone Steel Products Co. produces both clincher rims and straight side rims which can be mounted on the same wheel, using the same clamp fastenings.

MOST MILES
PER DOLLAR